Space Weather Forecast

Issued on Sunday, 19 November 2023 at 01:13 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Increasing chance of R1 minor radio blackouts. Risk minor geomagnetic storm G1, peaking Monday 20 November and again UTC midweek.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with the background level X-ray flux recorded at GOES16 gradually increasing into low Common-class. The largest flare was a low-end impulsive Moderate-class at 18/0542UTC, with a second similar flare observed at 18/1644UTC, and a third at 18/2234UTC. All of these flares appear to have originated from a large region now becoming visible on the northeastern solar horizon.

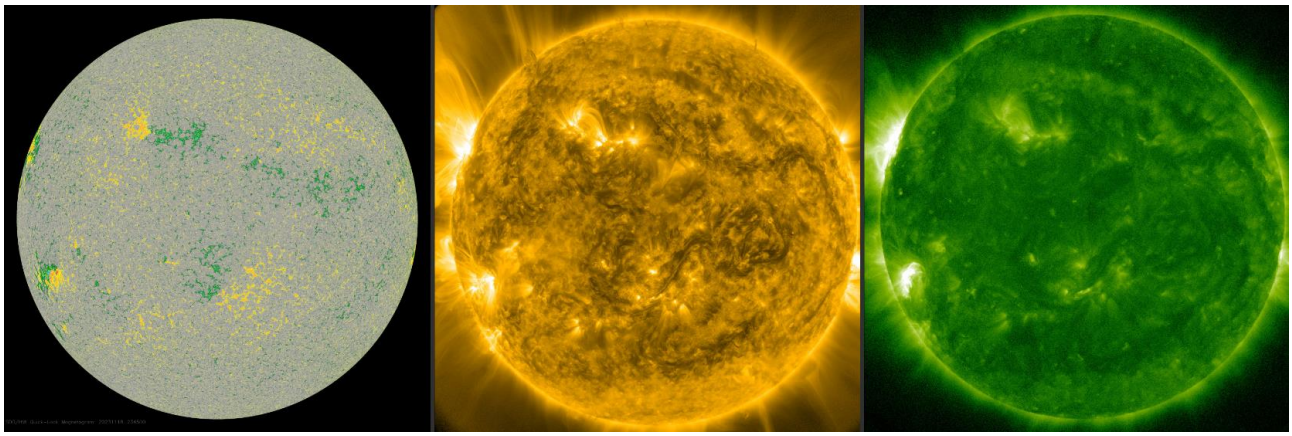

Figure 1: Solar imagery from 18/2400UTC, from left to right showing magnetic polarities; extreme UV and near-X-ray wavelengths. Of particular note is the arriving eastern limb, with further detail likely to be revealed in the coming hours.

There are now two sunspot regions on the Earth-facing disc, with a third having rotated off the southwest earlier in the 24 hours. While the surviving groups are very few in number - as seen across much of the past working week - these have a very different character, being much larger and more complex than their forebears. The southeastern group showed strong growth and proliferation of intermediate penumbral spots in the past 12 hours or so. To the northeast, an arriving region shows a large north-south span, and may yet be split into several groups, but is likely to become the most complex of the two groups when fully observable.

There have been numerous Coronal Mass Ejections (CMEs) observed on imagery over the last 24 hours, with a region narrowly behind the northeastern solar horizon proving most prolific, although no effects will be felt at Earth. More centrally and more notably, a slow 'filament lift-off' in the southwest occurred around 18/0630UTC. There was no subsequent CME seen on imagery and it is considered most likely to have been reabsorbed.

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Of potentially greater import was a small 'disappearing filament' seen on near infrared imagery leaving the southeast disc around 18/1600UTC. This has been analysed and is considered most likely to pass below and behind the track of the Earth's orbit to no effect. Finally, a large 'prominence eruption' was observed from the far southwestern octant - again to no effect at Earth. All considered, no new Earth-bound CMEs were in evidence.

Solar Wind / Geomagnetic Activity: Solar winds have pursued a languid slow regime at background levels throughout. The number of particles in the solar wind and their associated magnetic field were both unremarkable and near typical background levels. The net result of the above solar wind measures was for provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to increase in the current UTC weekend, with an increased chance of Moderate-class flares from arriving northeastern solar horizon regions in particular. A new steady state may be reached into the UTC working week.

Solar Wind / Geomagnetic Activity: There is one CME in the current forecast - the central filament from 16/0100UTC. This is due either late on day one, Sunday 19 November, or more likely in the UTC morning of 20 November. This carries a slight chance of Minor Geomagnetic Storm G1 peaking on Monday 20 November, but with sizeable error bars in onset time seeing a broad, flat peak that also encompasses the preceding and following UTC days.

The coronal hole forecast comprises two features - an initial weak unnumbered feature that may exacerbate the above CME should it arrive concurrently, and secondly a larger and more intense feature, which carries a greater chance of generating G1 midweek (UTC).

All considered, there is an initial broad, flat peak slight chance of G1 from the 16/0100UTC CME and perhaps a minor coronal hole. After a lull on Tuesday 21 November - perhaps the most reliably quiet day - there is then a chance of G1 from a more intense coronal hole rounding out the four-day forecast.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	20	5	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	40	50	50	50
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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